

Standards/Measurement Criteria

(**Draft)

Electronic Technology

CIP No. 15.0300

These state standards are designed to be delivered in a sequence of courses. *Standards 1-16 are to be taught as an introduction within the Electronic Technology program.

****Please note: The following CTE program Standards/Measurement Criteria are tentative until assessments are established.**

***1.0 CONDUCT A CAREER SURVEY OF THE ELECTRONIC TECHNOLOGY INDUSTRY**

- 1.1 Identify work activities associated with career pathways in electronic technology
- 1.2 Use technology to research career path information
- 1.3 Participate in a career development event
- 1.4 Develop a portfolio of career opportunity information in electronic technology

***2.0 DEVELOP JOB SEARCH SKILLS NECESSARY TO OBTAIN EMPLOYMENT IN THE ELECTRONIC TECHNOLOGY INDUSTRY**

- 2.1 Explain the steps in a job search
- 2.2 Identify employment opportunities in electronic technology
- 2.3 Critique a job application
- 2.4 Use technology in a job search

***3.0 PRACTICE EMPLOYABILITY SKILLS FOR JOB SUCCESS IN THE ELECTRONIC TECHNOLOGY INDUSTRY**

- 3.1 Use electronic technology vocabulary in context
- 3.2 Organize and deliver a technical demonstration/presentation
- 3.3 Use math and language skills in an occupational context
- 3.4 Generate new and creative ideas using critical thinking skills
- 3.5 Plan, organize and implement electronic technology related activities
- 3.6 Demonstrate accountability for materials, equipment and facilities
- 3.7 Complete tasks on time and accurately

***4.0 PARTICIPATE IN LEADERSHIP ACTIVITIES SUCH AS THOSE SUPPORTED BY A CAREER AND TECHNICAL STUDENT ORGANIZATION (SkillsUSA)**

- 4.1 Distinguish between various leadership styles
- 4.2 Identify personal leadership style
- 4.3 Practice effective meeting participation and management
- 4.4 Explore team problem solving techniques
- 4.5 Practice leadership skills in achieving a group goal
- 4.6 Determine the roles and responsibilities that leaders and members bring to an organization
- 4.7 Describe characteristics of an effective team member
- 4.8 Describe characteristics of effective teams
- 4.9 Participate in career development events
- 4.10 Develop and implement a personal and professional improvement plan
- 4.11 Explain proper business etiquette

***5.0 EXPLORE LEGAL AND ETHICAL ISSUES IN THE ELECTRONIC TECHNOLOGY INDUSTRY**

- 5.1 Explain legal responsibilities of electronic technology employees to comply with state and federal government laws and regulations
- 5.2 Explain employer expectations on ethical workplace behavior and how they are expressed in organizational policies and culture
- 5.3 Evaluate alternative responses to workplace situations based on personal, professional, and legal responsibilities
- 5.4 Identify workers' rights regarding the workplace issues including safety, drug testing, harassment, discrimination, privacy, etc.

***6.0 EXPLORE PRINCIPLES OF THE ELECTRONIC TECHNOLOGY INDUSTRY**

- 6.1 Recognize relationship between trades/professions related to electronic technology to facilitate smooth workflow
- 6.2 Discuss how quality of work affects profitability in electronic technology
- 6.3 Compare management styles, including the styles related to cultural differences
- 6.4 Examine current global trends in electronic technology
- 6.5 Investigate types of electronic manufacturing systems
- 6.6 Classify types and properties of materials used in electronics manufacturing
- 6.7 Investigate the process of a feasibility study for the production of a product
- 6.8 Sequence the steps in the process flow to manufacture a product

***7.0 APPLY COMMUNICATION SKILLS FOR THE ELECTRONIC TECHNOLOGY FIELD**

- 7.1 Apply basic oral and written communication skills
- 7.2 Apply listening skills
- 7.3 Organize and deliver a demonstration/presentation
- 7.4 Interpret verbal and nonverbal communication
- 7.5 Communicate with individuals from diverse cultural backgrounds using appropriate language
- 7.6 Identify barriers to effective communication
- 7.7 Practice skills used to communicate with clients
- 7.8 Identify guidelines for effective written communication (letters, reports, email)

***8.0 DEMONSTRATE TECHNOLOGICAL LITERACY FOR THE ELECTRONIC TECHNOLOGY WORKPLACE**

- 8.1 Examine the uses of technology
- 8.2 Communicate using telecommunication tools
- 8.3 Demonstrate basic usage of computers (input, storage, output)
- 8.4 Access information electronically (i.e. Internet, CD-ROM, network etc.)
- 8.5 Demonstrate knowledge and understanding of basic Input/Output devices such as keyboards, video monitors, scanners, printers and peripherals
- 8.6 Apply file and disk management techniques

***9.0 APPLY MATHEMATICAL PROCESSES TO PROBLEMS IN ELECTRONIC TECHNOLOGY**

- 9.1 Express problems in electronic technology using numeric, symbolic and/or graphic representations
- 9.2 Perform mathematical calculations in the context of electronic technology problems
- 9.3 Recognize and use metric units of length, weight, volume and/or temperature

***10.0 APPLY MEASUREMENT TECHNIQUES TO PROBLEMS IN ELECTRONIC TECHNOLOGY**

- 10.1 Demonstrate knowledge of units of measurement (English and metric)
- 10.2 Perform conversions between English and Metric measurements
- 10.3 Identify common measurement tools used in electronic technology and their functions
- 10.4 Select an appropriate measurement technique for a specific measurement need
- 10.5 Select and use the appropriate measurement tool for the task
- 10.6 Determine degree of accuracy required for a specific task or situation in engineering, scientific and mathematical notations

***11.0 APPLY PROBLEM SOLVING AND DECISION MAKING PROCESSES TO ELECTRONIC TECHNOLOGY RELATED SITUATIONS**

- 11.1 Identify and apply problem-solving processes (e.g. Lean and Sigma)
- 11.2 Describe methods of determining priorities in electronic technology
- 11.3 Prepare a plan of work, schedule electronic technology tasks, and identify needed resources
- 11.4 Solve electronic technology problems individually and as part of a team
- 11.5 Generate new and creative ideas using critical thinking skills in solving electronic technology related problems
- 11.6 Evaluate facts, use logic and reason in decision making
- 11.7 Access information using manuals and reference materials in order to solve an electronic technology related problem
- 11.8 Explain using a decision matrix to solve a problem in electronic technology

***12.0 PRACTICE SAFE WORKING PROCEDURES IN AN ELECTRONIC TECHNOLOGY ENVIRONMENT**

- 12.1 Identify responsibilities of professionals in electronic technology in creating/maintaining a safe work environment
- 12.2 Explain appropriate safety precautions around common job-site hazards in electronic technology
- 12.3 Practice basic procedures for safe storage and upkeep of tools and materials used in electronic technology

***13.0 INTERPRET SCHEMATICS, BLUEPRINTS AND TECHNICAL DRAWINGS UTILIZED IN ELECTRONIC TECHNOLOGY**

- 13.1 Interpret dimensions, symbols, legends, scales, and directions
- 13.2 Demonstrate drawing and visualization skills for the electronic technology field

***14.0 EXPLORE ELECTRICAL/ELECTRONICS TECHNOLOGY**

- 14.1 Investigate the fields within the electronics industry (communications, micro-technology, etc.)
- 14.2 Discuss environmental issues and trends in the electronics industry
- 14.3 Describe how changing technology and economy impacts the electronics industry
- 14.4 Identify electrical/electronic components
- 14.5 Explore the functions and applications of basic electrical components (e.g., solenoid, switch, and light circuit)
- 14.6 Distinguish between analog and digital circuits
- 14.7 Investigate operating characteristics of diodes and transistors

***15.0 DESCRIBE ELECTRICITY CONCEPTS**

- 15.1 Express the basic scientific laws of electricity and how they are utilized in electronic technology
- 15.2 Identify basic concepts of work and energy, unit of energy, energy conversion, efficiency, structure matter, and electric charge
- 15.3 Describe the following terms: valence and free electrons, ions and their relationship to conductivity, and uses of static electricity

***16.0 DETERMINE ELECTRICAL QUANTITIES, UNITS, AND CIRCUITS**

- 16.1 Identify common electrical components, quantities and units
- 16.2 Define continuity and its purpose
- 16.3 Explain voltage, current and resistance in electric circuits
- 16.4 Calculate Ohm's law, energy, and power
- 16.5 Build a DC series circuit
- 16.6 Build a DC parallel circuit
- 16.7 Build a DC series-parallel circuit
- 16.8 Build voltage divider circuits
- 16.9 Demonstrate knowledge of magnetism and electromagnetism
- 16.10 Determine the current, voltage, and resistance in electric circuits without damaging the meter or circuit
- 16.11 Explain the relationship between scales and ranges on multi-scale, multi-range meters
- 16.12 Build a simple electronic circuit/device/component jto solve a simulated scenario

17.0 DEVELOP AN INDIVIDUAL CAREER PLAN

- 17.1 Investigate career options including entrepreneurship
- 17.2 Develop career goals based on interests, aptitudes, and research
- 17.3 Review/revise/plan goals on annual basis
- 17.4 Demonstrate techniques to manage personal and career goals
- 17.5 Evaluate factors that contribute to job satisfaction and success

18.0 PREPARE FOR EMPLOYMENT IN ELECTRONIC TECHNOLOGY

- 18.1 Develop a resumé
- 18.2 Research an electronic technology organization as a potential employee
- 18.3 Complete job application process
- 18.4 Demonstrate interviewing skills, including pre-interview preparation and post-interview follow-up

19.0 PARTICIPATE IN WORK-BASED LEARNING EXPERIENCES IN ELECTRONIC TECHNOLOGY

- 19.1 Use technology appropriate for the job
- 19.2 Demonstrate positive work behaviors
- 19.3 Demonstrate positive interpersonal behaviors
- 19.4 Demonstrate safe and healthy work behaviors
- 19.5 Adapt to changes in the electronic technology workplace
- 19.6 Participate in a variety of work-based experiences, paid or non-paid job

20.0 DEMONSTRATE ORAL COMMUNICATION SKILLS FOR ELECTRONIC TECHNOLOGY

- 20.1 Conduct formal/informal research to collect appropriate topical information
- 20.2 Use questioning techniques to obtain needed information from an audience
- 20.3 Interpret oral and nonverbal communications of the audience
- 20.4 Demonstrate active listening during communications
- 20.5 Demonstrate appropriate technologies for a formal presentation
- 20.6 Prepare and deliver an electronic technology presentation
- 20.7 Deliver presentation incorporating both appropriate verbal and nonverbal communication techniques
- 20.8 Communicate using equitable and culturally sensitive language for a diverse audience
- 20.9 Demonstrate effective telephone techniques

21.0 DEMONSTRATE WRITTEN COMMUNICATION SKILLS FOR THE ELECTRONIC TECHNOLOGY INDUSTRY

- 21.1 Conduct formal/informal research to collect appropriate topical information
- 21.2 Organize research information and develop an outline in electronic technology
- 21.3 Write electronic technology business communication using appropriate format for the situation
- 21.4 Using appropriate technology, prepare a draft document using established rules for grammar, spelling and sentence construction
- 21.5 Utilize multiple technologies for written and presentation communications on electronic technology

22.0 PARTICIPATE IN LEADERSHIP ACTIVITIES SUCH AS THOSE SUPPORTED BY A CAREER AND TECHNICAL STUDENT ORGANIZATION (SkillsUSA)

- 22.1 Determine the roles and responsibilities that leaders and members bring to an organization
- 22.2 Evaluate characteristics of effective teams
- 22.3 Evaluate characteristics of an effective team player
- 22.4 Practice techniques to involve each member of the team
- 22.5 Demonstrate team work
- 22.6 Practice effective meeting management
- 22.7 Demonstrate business etiquette
- 22.8 Practice decision-making processes

23.0 DEMONSTRATE SAFE WORK HABITS FOR ELECTRONIC TECHNOLOGY

- 23.1 Wear and use personal safety clothing, gear and equipment
- 23.2 Apply hazardous materials (HAZMAT) procedures
- 23.3 Identify types of fires and fire extinguishers
- 23.4 Maintain worksite safety and housekeeping
- 23.5 Demonstrate appropriate handling and lifting methods
- 23.6 Demonstrate safe use and maintenance of tools and equipment in electronic technology

24.0 APPLY FUNDAMENTALS OF ALTERNATING CURRENT (AC)

- 24.1 Explain alternating current and voltage
- 24.2 Describe four ways to express the magnitude of alternating current
- 24.3 Analyze capacitors through calculation and measurement
- 24.4 Analyze inductors through calculation and measurement
- 24.5 Analyze transformers through calculation and measurement

25.0 SOLVE MAGNETISM AND ELECTROMAGNETISM CIRCUIT PROBLEMS

- 25.1 Explain magnetism, magnets, magnetic fields, flux and poles, electromagnetism
- 25.2 Determine the direction of magnetic flux created by a current carrying conductor
- 25.3 Predict the direction of the force between current carrying conductors
- 25.4 Solve magnetic circuit problems using magnetic quantities and units

26.0 DETERMINE TRANSFORMER RATINGS

- 26.1 Determine the transformer ratings that are appropriate for the job to be done
- 26.2 Connect transformer windings in series and/or parallel to obtain the desired voltage and current capabilities

27.0 ASSEMBLE RC, RL, AND RCL CIRCUITS

- 27.1 Calculate impedance and phase angle for RC, RL and RCL circuits when the components are connected in either series or parallel
- 27.2 Calculate the resonant frequency, the quality and the bandwidth of LC circuits
- 27.3 Classify and explain the uses of simple filter circuits
- 27.4 Perform circuit analysis on RL circuits including time constant
- 27.5 Perform circuit analysis on RC circuits including time constant
- 27.6 Analyze through calculation RCL circuits and resonance
- 27.7 Construct an AC series circuit
- 27.8 Assemble an AC parallel circuit
- 27.9 Build an AC series-parallel circuit

28.0 DESCRIBE ELECTRIC MOTORS AND HOW THEY ARE USED IN ELECTRONICS

- 28.1 Select an appropriate motor for a specific application by using motor ratings
- 28.2 Explain the characteristics of each type of single-phase motor
- 28.3 Explain the characteristics of the major types of DC motors

29.0 EXPLAIN THE USES OF SEMICONDUCTORS

- 29.1 List common electronic elements as conductors or semiconductors
- 29.2 Estimate the effect of temperature on insulators, conductors and semiconductors
- 29.3 Illustrate the directions of electron and hole currents in semiconductors
- 29.4 Identify the majority and minority carriers in N-type semiconductors
- 29.5 Identify the majority and minority carriers in P-type semiconductors

30.0 CALCULATE PROBLEMS RELATED TO DIODES

- 30.1 Estimate the conductivity of diodes under the conditions of forward and reverse bias
- 30.2 Interpret volt-ampere characteristic curves for diodes
- 30.3 Inspect diodes to determine the cathode and anode leads

31.0 CALCULATE VARIOUS POWER SUPPLIES PROBLEMS

- 31.1 Describe how the common rectifier circuits work
- 31.2 List the characteristics of filter configurations
- 31.3 Calculate power-supply ripple percentage and voltage regulation
- 31.4 Calculate the DC output voltage for filtered and unfiltered power supplies

32.0 EXPLAIN THE USES OF TRANSISTORS

- 32.1 Categorize the schematic symbols for several types of transistors
- 32.2 Describe amplification and power gain
- 32.3 Calculate the correct bias polarity for several types of transistors
- 32.4 Estimate current gain from data and from characteristic curves
- 32.5 Calculate collector dissipation from data and from characteristic curves
- 32.6 Analyze bipolar transistors with an ohmmeter

33.0 ANALYZE THE CHARACTERISTICS OF AMPLIFIERS

- 33.1 Estimate decibel gain and loss
- 33.2 Locate the operating point for a basic common-emitter amplifier
- 33.3 Determine common-emitter amplifier
- 33.4 Explain the importance of impedance matching
- 33.5 Describe the characteristics of the standard methods of signal coupling
- 33.6 Estimate the input impedance of common-emitter amplifiers
- 33.7 Calculate voltage gain in cascade amplifiers
- 33.8 Decode FET amplifier circuits
- 33.9 Predict the power bandwidth for operational amplifiers
- 33.10 Verify voltage gain for operational amplifiers
- 33.11 Calculate the small-signal bandwidth for operational amplifiers
- 33.12 Determine component-level defects by using voltage analysis
- 33.13 Troubleshoot operational-amplifier circuits

34.0 PREDICT OSCILLATOR OPERATIONS

- 34.1 Estimate gain and feedback of oscillators
- 34.2 Estimate the frequency of operation of oscillators
- 34.3 Analyze problems with oscillators

35.0 EXAMINE OPERATION OF BASIC RADIO RECEIVERS

- 35.1 Describe modulation and demodulation
- 35.2 Compare and contrast the characteristics of AM, SSB and FM
- 35.3 Calculate the oscillator frequency for super heterodyne receivers
- 35.4 Troubleshoot receivers

36.0 ANALYZE INTEGRATED CIRCUIT TECHNOLOGY

- 36.1 Compare and contrast integrated circuit (IC) technology to discrete technology
- 36.2 Formulate calculations for 555 timer circuits
- 36.3 Recognize analog, digital and mixed-signal ICs
- 36.4 Analyze circuits with ICs

37.0 ANALYZE ELECTRONIC CONTROL DEVICES AND CIRCUITS

- 37.1 Estimate efficiency in control circuits
- 37.2 Recognize the schematic symbols for thyristors
- 37.3 Describe how thyristors operate
- 37.4 Explain conduction angle in thyristor circuits
- 37.5 Describe commutation in thyristor circuits
- 37.6 Troubleshoot control circuits

38.0 SUMMARIZE REGULATED POWER SUPPLIES OPERATIONS

- 38.1 Identify power supply regulator circuits
- 38.2 Differentiate regulated power supplies problems

39.0 ANALYZE DIGITAL SIGNAL PROCESSING CIRCUITS

- 39.1 Create the block diagram for a typical DSP system
- 39.2 Explain the advantages of DSP
- 39.3 Describe the operation and design of digital filters
- 39.4 Solve DSP system problems
- 39.5 Build combinational logic circuits using logic gates and predict/describe operation
- 39.6 Build sequential logic circuits using flip-flops and predict operations
- 39.7 Explain the operation of serial and parallel shift registers and compare attributes of each
- 39.8 Explain operation of A-D converters, D-A converters
- 39.9 Describe operation of Programmable Logic Controllers (PLCs)
- 39.10 Input Source and OP code for a processor controlled system
- 39.11 Input high level code programming (BASIC, C++, etc.) in a PC based system
- 39.12 Describe operation of a typical computer system (PC) to the component level
- 39.13 Describe Common Peripheral and pointing devices and interfacing methods (Serial, Parallel, USB, SCSI, docking ports, etc.)
- 39.14 Explain operation of MODEMS
- 39.15 Describe operation of fiber optic communications system and compare to hard line systems
- 39.16 Demonstrate capability to open, operate and configure Microsoft operating systems and applications